



TBS Unify Pro32 HV

Analog 5.8 GHz video transmitter
User manual



Always connect the antenna before powering up. Set the channel and output power only in accordance with the regulations of the country of use - in the Czech Republic without a licence only 5725-5875 MHz and max. 25 mW e.i.r.p.

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1. Safety and radio operation

1.1 Safety instructions

- Always connect a 5.8 GHz **antenna** before applying power. Operating the transmitter without an antenna or with a damaged antenna can permanently damage it.
- The supply voltage must match the specifications in chapter 2.2. Observe the correct polarity – reverse polarity or overvoltage will destroy the transmitter.
- The transmitter heats up during operation. Ensure adequate heat dissipation (chapter 3.1) and do not touch it right after switching off.
- Isolate the contacts and solder pads from the carbon frame – carbon is conductive and may cause a short circuit.
- Always disconnect the battery before soldering, changing the wiring or replacing the antenna.
- Do not plug/unplug the MMCX connector more often than necessary and do not strain it by pulling or bending.
- This product is not a toy. Keep it out of the reach of children.

1.2 Frequencies, output power and the law of the country of use

Radio equipment is placed on the EU market under Directive 2014/53/EU (RED), but the conditions of its use – permitted frequency bands, maximum output power and the conditions of amateur radio operation – are set by national regulations and differ from country to country. The information in this chapter describes the situation in the Czech Republic. If you operate the transmitter in another country, you must follow the regulations of the country in which you operate it.

Frequency range of the transmitter	5645–5945 MHz (individual channels see chapter 4.3)
Selectable output power	25 mW (14 dBm), 100 mW (20 dBm), 400 mW (26 dBm), 1000 mW (30 dBm, “MAX” in the menu)
Maximum output power	1000 mW (30 dBm)
As delivered	locked – only channels without the * mark and 25 mW output power are available

► Operation in the Czech Republic

- Without an individual licence, the transmitter may be operated under the general authorisation of the Czech Telecommunication Office **VO-R/10** only in the **5725–5875 MHz** band with a maximum of **25 mW e.i.r.p.** The radiated power (e.i.r.p.) includes the antenna gain.
- Channels marked * and ** and output powers of 100, 400 and 1000 mW are outside the conditions of the general authorisation. They may only be used by holders of an amateur radio licence and only within the scope permitted by that licence (amateur band 5650–5850 MHz under Decree No. 156/2005 Coll.).
- The user is responsible for the channel and power setting. Outside the Czech Republic, the limits of the country of use apply.

❖ Only unlock channels and power levels reserved for radio amateurs (chapter 4.4) if you hold a valid licence.

2. Product description

The TBS Unify Pro32 HV is an analog 5.8 GHz video transmitter (VTX) by Team BlackSheep. It is a successor to the TBS Unify Pro line with improved robustness, decreased size and power consumption and power-to-channel calibration. It can be controlled by the on-board button, by SmartAudio 2.1 from the flight controller (FC) or by CRSF from TBS Crossfire / Tracer receivers.



TBS Unify Pro32 HV

2.1 Key features

- power-to-channel calibration for each channel – extremely consistent output power,
- one-button frequency and power setup,
- OSD configuration using TBS SmartAudio 2.1 (via FC, TBS Crossfire / Tracer or PNP PRO OSD),
- LUA support for CRSF users,
- MMCX antenna connector,
- 2S–6S input with 5 V output for the camera,
- double noise filtering, optimized heat dissipation,
- built-in microphone (audio on 6.5 MHz),
- firmware update via USB.

2.2 Specifications

Manufacturer	Blacksheep Avionics Co. Ltd., 44-46 Hung To Rd, 12/F, Unit 1204, Century Centre, Kwun Tong, Hong Kong; rpirker@team-blacksheep.com; www.team-blacksheep.com
Type	TBS Unify Pro32 HV (MMCX), A-TBSS-UPH32
Video system	analog, NTSC / PAL
Video input impedance	75 Ω
Input voltage	2S–6S LiPo; the manufacturer specifies 6–25 V (the input is marked 7–26V on the board)
Camera output	regulated and filtered 5 V / 2 A
Output power	25 / 100 / 400 / 1000 mW (14 / 20 / 26 / 30 dBm)
Channels	bands A, B, E, Airwave, Race Band
Audio	yes, built-in microphone (6.5 MHz)
Protocols	SmartAudio V2.1, CRSF
Extra features	PITMode (incl. support for team racing), CleanSwitch, full CRSF capability
Power consumption	25 mW: 90–130 mA (22–14.8 V); 1000 mW: 300–450 mA (22–14.8 V)
Range (manufacturer data)	up to 6 km with an omni antenna; depends on power, antennas and environment
Antenna connector	MMCX
Port connector	JST-GH, 7 pin
Dimensions	37 × 25 × 5.8 mm
Weight	8.7 g
Firmware upgrade	yes, via USB (TBS Agent Web / Desktop)

❖ **Do not exceed a supply voltage of 25 V. Do not use 6S LiHV batteries (26.1 V fully charged).**

2.3 Kit contents

- 1× TBS Unify Pro32 5G8 HV video transmitter
- 1× JST-GH 7-pin silicone cable, ends pre-tinned
- 1× MMCX to SMA pigtail
- 1× heat transfer tape for mounting

Antenna, camera and battery are **not** included.

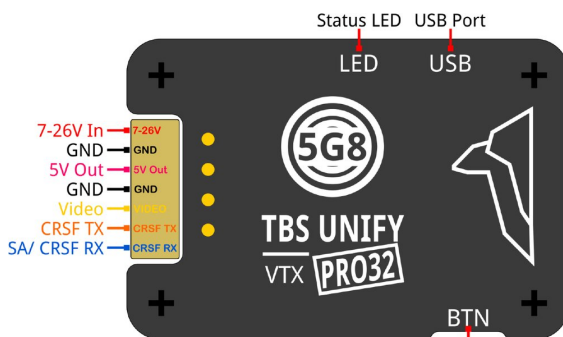
3. Installation and wiring

3.1 Mounting and cooling

When installing the Unify Pro32 HV, please ensure adequate airflow and – most importantly – heat transfer. Mounting the transmitter with some pressure against a flat piece of carbon (e.g. using the included heat transfer tape) will give you the best results. Make sure to isolate the contacts of the Unify against the carbon to avoid short circuits. Proper mounting will allow the video transmitter to run for extended periods of time while sitting on the ground and without reducing output power. The TBS Unify Pro32 HV automatically reduces output power before it reaches critical heat levels.

3.2 Wiring

The transmitter comes with a cable assembly with silicone wires for easy installation in your build. The installed, more powerful step-down converter (DC/DC) is capable of powering most 5V cameras on the market via the 5V Out pin.



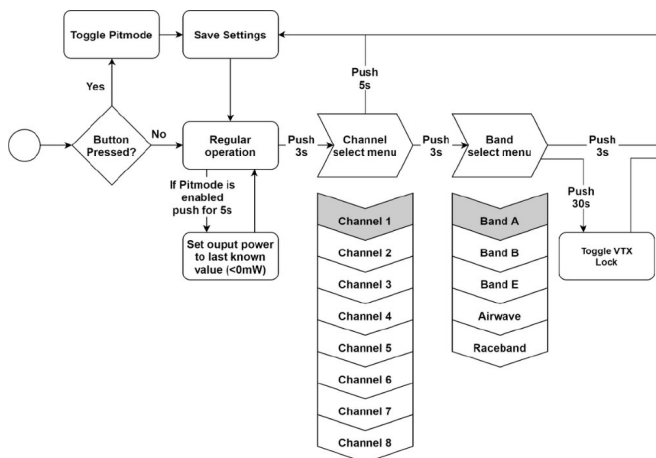
TBS Unify Pro32 HV pinout

Pin	Function
7-26V	battery input (2S-6S LiPo, max. 25 V – see chapter 2.2)
GND	ground
5V Out	5 V output for the camera
VIDEO	video signal input from the camera
CRSF TX	CRSF serial output
SA / CRSF RX	SmartAudio or CRSF input
LED	status LED
USB	USB port (firmware update, configuration via TBS Agent)
BTN	button

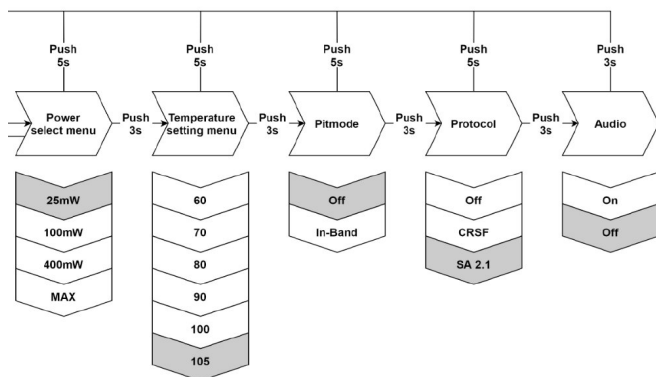
4. Button menu control

The menu consists of categories and settings. To enter the menu, hold the button for 3 seconds. Pressing the button for 3 seconds toggles between categories, pressing it for a short time toggles between settings. LED colors signal the state of the menu.

4.1 Button menu structure



Menu structure - part 1: channel, band, lock (Push 3s / 5s / 30s = hold the button)



Menu structure - part 2: power, temperature limit, PITmode, protocol, audio (default settings in grey)

- **Default settings:** channel 1, band A, power 25 mW, temperature limit 105, PITMode off, protocol SA 2.1, audio off.
- **Saving the settings:** according to the diagram, by holding the button in the respective category (Push 5s, for the Audio category Push 3s).
- **PITMode at power-up:** pressing the button while connecting power toggles the PITMode flag. If PITMode is enabled, holding the button for 5 s sets the output power to the last known value.

4.2 LED signals and menu table

The transmitter signals the selected channel, band and power level at every startup using a sequence of LED codes; the same sequence is also used in the menu. First, the **red LED** flashes to indicate the item (1× channel, 2× band, 3× power level), then the **blue LED** flashes to indicate the value.

Red	Item	Value (number of blue LED flashes)
1×	Channel	1× to 8× = channel 1 to 8
2×	Band	1× A · 2× B · 3× E · 4× Airwave · 5× Race Band
3×	Power level	1× 25 mW · 2× 100 mW · 3× 400 mW · 4× 1000 mW
4×	Temp. limit	1× 60 · 2× 70 · 3× 80 · 4× 90 · 5× 100 · 6× 105
5×	PITMode	1× OFF · 2× IN-BAND
6×	Protocol	1× OFF · 2× CRSF · 3× SmartAudio (SA)
7×	Audio (mic)	1× OFF · 2× ON

4.3 Channel / band - frequency table (MHz)

Channel	1	2	3	4	5	6	7	8
A	5865	5845	5825	5805	5785	5765	5745	5725*
B	5733	5752	5771	5790	5809	5828	5847	5866
E	5705*	5685*	5665*	5645**	5885*	5905*	5925**	5945**
Airwave	5740	5760	5780	5800	5820	5840	5860	5880*
Race Band	5658*	5695*	5732*	5769	5806	5843	5880*	5917*

- no mark – available in the locked state (all these channels are within the 5725–5875 MHz band),
- * – only after unlocking, requires an amateur radio (HAM) licence,
- ** – only with custom firmware on special request (large events with prior legal body approval).

The video transmitter ensures that you cannot select locked channels or power levels by accident: when controlled by the push button, you need to confirm having a HAM licence by unlocking the transmitter (chapter 4.4).

4.4 Unlock and power select mode (HAM users only)

- Go to the band selection menu (unlocking only works there).
- Press the button for about 30 seconds. The red LED will flash 3 times to confirm
 - the transmitter is unlocked for all frequencies and the power select mode is accessible.
- To lock the transmitter, return to the band selection menu and press the button for 20 to 25 seconds again.

❖ Only use the unlock function with a valid amateur radio licence and within the scope it permits (see chapter 1.2).

5. Control by flight controllers and TBS receivers

5.1 Flight controller (FC) – SmartAudio

Using any SmartAudio V2.1-compatible flight controller, simply connect the SmartAudio data pin (SA / CRSF RX) to a free and supported port (UART) on your FC. In the Betaflight configurator, set the connected port to the SmartAudio protocol. Use firmware that supports SmartAudio 2.1 – this gives you access to the new power levels.

Newer Betaflight versions require a **VTX table**. The VTX tables for TBS Unify transmitters are available on the manufacturer's product page: team-blacksheep.com – [VTX Table for Betaflight](#).

5.2 TBS Crossfire / Tracer – direct connection

Your TBS Crossfire or Tracer receiver can control the transmitter directly without an FC. This is helpful when you don't have an FC in your aircraft, have no free UART left, or don't want any extra setup. See the Crossfire and Tracer manuals for details on how to set them up.

► Connection using SmartAudio

- Set the transmitter to SmartAudio using the button.
- Select a free output pin on the receiver capable of SA.
- Connect the receiver's SA TX to the SA / CRSF RX pin of the transmitter.

Now you can control the transmitter using the *Video TX* menu or the VTX menu of the receiver (e.g. in Agent Lite).

► Connection using CRSF

All Unify Pro32 transmitters have a full serial CRSF interface with extended functionality compared to SmartAudio, which is just a one-wire protocol.

- Set the transmitter to CRSF using the button.
- Select a free output pin pair on the receiver capable of CRSF.
- Connect the receiver's TX to the SA / CRSF RX pin and the receiver's RX to the CRSF TX pin of the transmitter.

Now you can control the transmitter using the *My VTX* menu or its device menu (e.g. in Agent Lite).

5.3 SmartAudio or CRSF?

- **SmartAudio** – single wire connection, saves one output (useful on a wing).
- **CRSF** – fully configurable by LUA, FUSION, AGENT M Web etc.; lets you use PITMode on a switch without an FC.

5.4 Button not working

When the transmitter detects a signal on the RX pin, it disables the button. To change the transmitter to CRSF or SA, unsolder the wire or force your Crossfire / Tracer receiver not to output any signal:

- set the output of the Tracer receiver to CH X (PWM) for the pin the transmitter is connected to,
- shut down the Tracer transmitter and receiver,
- power up just the model with the receiver and the Unify Pro32 HV,
- change the transmitter settings using the button,
- turn the radio transmitter back on,
- set the output map back to CRSF or SmartAudio.

The HV version has a USB port, so the settings can also be changed in TBS Agent. If everything is set up correctly, the transmitter appears in the LUA script, in the device menu or on the Crossfire OLED display.

5.5 Barcode control

The video transmitter can be controlled via barcodes through your camera. Holding the barcode in front of your camera enables PITMode and powers up the video transmitter. You can simply carry your favorite channel in your pocket and revert to it quickly.

- Barcode catalog (PDF): www.team-blacksheep.com/tbs-VTX-barcodes.pdf
- Barcode generators: noahwaldner.ch/en/tbs-barcode-generator, apocalypse.github.io/UnifyEvoBarcodeGenerator
- Raw JSON file: firmware.team-blacksheep.com/barcodes

6. Transmitter features

6.1 PITMode

PITMode is a mode where the video transmitter only runs on very low output power. This prevents interference with others at events while still allowing a minimum of visibility for last-minute setting changes. The button toggles the PITMode flag at power-up; SmartAudio or CRSF can modify this flag as well. SmartAudio can also enter PITMode during runtime using the power setting 0 mW, which does not modify the flag (the transmitter never powers up at the 0 mW setting). To leave PITMode during operation, simply set the desired power using SmartAudio, CRSF or the button menu. An enabled PITMode is indicated by a flashing red LED.

6.2 SmartAudio 2.1

SmartAudio is a protocol developed by TBS for OSD to VTX communication – a single-wire UART protocol running over the (audio) wire. All modern flight controllers support it. Version 2.1 changed the control of PITMode in operation to a switch (on / off) rather than a flag that is refreshed on reboot. Specification: team-blacksheep.freshdesk.com.

6.3 CRSF

CRSF is a protocol designed by Team BlackSheep for the TBS Crossfire system – a high-bandwidth, low-latency, full-duplex serial data transmission protocol with over-the-air (OTA) firmware upgrades, localized configuration menus and a smart routing protocol. Via CRSF, the channel, output power and PITMode of the Unify Pro32 HV can be configured.

6.4 CleanSwitch

When video transmitters power up or change frequency, they usually send a burst across the entire band which disturbs fellow pilots. All Unify Pro32 transmitters remain at their lowest power output (less than 0.1 mW) while changing channels and powering up. This ensures interruption-free racing, even with multiple video transmitters changing channels or powering up.

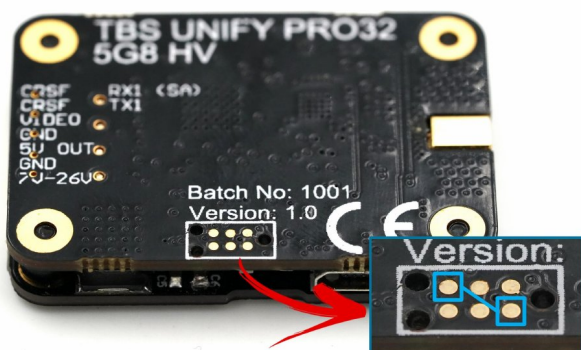
7. Firmware

7.1 Firmware update

To update the firmware, you need **TBS Agent Web / Desktop**, available on the manufacturer's website (www.team-blacksheep.com/download). Connect the transmitter to the computer via USB and run the update in TBS Agent.

7.2 Forcing bootloader mode

In rare cases, forcing the device into bootloader mode can be required. Bridge the 2 pads shown in the picture and then power up. This is not required for regular operation.



Pads for forcing bootloader mode (blue) on the underside of the board

8. Information for the EU and Czech Market

8.1 Importer and responsible person in the EU

The product is placed on the European Union market by the importer stated below, who is at the same time the responsible person within the meaning of Article 16 of Regulation (EU) 2023/988 of the European Parliament and of the Council on general product safety (GPSR).

Importer / responsible person in the EU	Rotorama, s.r.o.
Company ID (IČO)	051 57 692
VAT ID (DIČ)	CZ05157692
Registered office	Okrajová 1351, 674 01 Třebíč, Czech Republic
E-mail	info@rotorاما.cz
Phone	+420 252 252 098
Website	www.rotorاما.com

8.2 Product conformity



- The product bears the **CE** marking and complies with the requirements of the applicable European Union harmonisation legislation.
- A copy of the **EU Declaration of Conformity** is available from the importer at the address stated above or at the e-mail address info@rotorاما.cz.
- **Product identification:** the type designation (TBS Unify Pro32 HV, A-TBSS-UPH32) and the production batch number (Batch No.) are printed on the underside of the transmitter board.

8.3 Disposal of electrical equipment



- The crossed-out wheeled bin symbol on the product, its packaging or in the documentation means that at the end of its service life the product **must not be disposed of together with mixed municipal waste.**
- Hand it over at a take-back point for electrical equipment – at a collection yard, at a take-back point of a collective system, or at the retailer when purchasing a new equivalent product. Take-back is free of charge for the end user.
- The obligations under Act No. 542/2020 Coll., on end-of-life products, are fulfilled by the importer through a collective take-back system.
- Proper disposal helps prevent negative impacts on the environment and human health and contributes to the reuse of secondary raw materials.

Through its contractual partner **ASEKOL a.s.**, the company ensures the take-back of waste electrical equipment from households and the separate collection of waste electrical equipment, batteries and accumulators in accordance with the applicable legislation. The customer is entitled to hand over old electrical equipment or a battery or accumulator at any collection point of the above contractual partner. The addresses of these take-back points are listed at www.asekol.cz, www.ecobat.cz and also <https://visoh2.mzp.cz/RegistrMistZO/RegistrMistZOPublic/MapaMistZpetOdberu>.

9. Warranty and rights arising from defective performance

The rights and obligations of the contracting parties are governed by Czech law, in particular by Act No. 89/2012 Coll., the Civil Code, and Act No. 634/1992 Coll., on consumer protection.

- The seller is liable to the buyer for the product being free of defects on receipt. If the buyer is a consumer, a defect may be notified **within two years of receipt** of the product (Section 2165 of the Civil Code).
- If a defect appears within **one year** of receipt, the product is deemed to have been defective already at the time of receipt (Section 2161(5) of the Civil Code).
- When purchasing online, a consumer has the right to **withdraw from the contract within 14 days** of receiving the goods without giving a reason (Section 1829 of the Civil Code).
- Claims should be made with the retailer from whom you purchased the product. The importer's contact details are given in Chapter 8.1.
- The competent body for out-of-court settlement of consumer disputes is the **Czech Trade Inspection Authority**, Štěpánská 796/44, 110 00 Prague 1, www.coi.cz.